

Chemical Microsensor Instrument for UAV Airborne Atmospheric Measurements, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

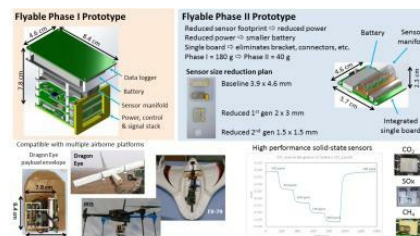


ABSTRACT

The rapid expansion of available UAV types and increased mission capability (payload, flight duration, and system cost reductions) offers wide range of potential applications. The Airborne Chemical Microsensor System (AMS) instrument package being developed adapts low cost and low power chemical microsensor technology which has been demonstrated for fire detection and exhaust emission monitoring to airborne measurements. The fast time response and miniaturized system will provide a lightweight, low cost instrument for package for a wide range of deployments including aerostats (balloons and kites) to UAV such as Dragon Eye and SIERRA. Chemical species mapping using UAVs enables model validation and attaining new data that complements and augments traditional aerial and satellite data. However, there currently are limited options adapting commercial chemical sensors for detecting all species of interest at the levels required, and with fast response time. Wet electrochemical cells, which provide accurate measurement for some species, are typically slow (30-60 sec), sensitive to pressure changes, and are a potential hazard from leakage. Most commercial environmental carbon dioxide monitors are based on NDIR, with response time in the order of minutes. Hydrocarbons are monitored by generic combustible gas sensors. Instruments need to be low cost, compact and robust enough for incorporation in UAV systems, capable of surviving hard landings and sufficiently low cost that damage to the instrument and or loss of the UAV is not a major setback for the mission. The proposed solid-state, microsensor technology is well suited for this application, because of the low production cost and robust packaging. The proposed program provides a low cost instrument (less than \$1000 in limited quantities) for real-time carbon dioxide, sulfur dioxide, and methane detection.

ANTICIPATED BENEFITS

To NASA funded missions:

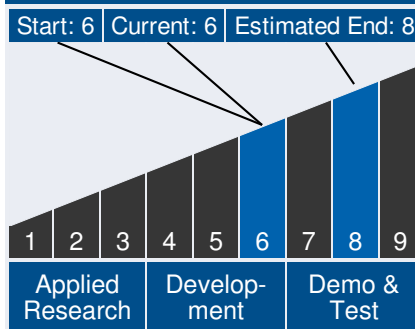


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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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Potential NASA Commercial Applications: UAVs will see an expanded role in support NASA science missions. Recent applications for the UAV based chemical sensing currently include the study of volcanoes to validate atmospheric models and to gain new insight into mechanisms. Near term application of the Airborne Chemical Microsensor System (AMS) would be to assist NASA's work studying volcanic activity such as tracking volcano emissions.

To the commercial space industry:

Potential Non-NASA Commercial Applications: There is a large commercial market for low cost deployable atmospheric monitoring systems. Air quality management districts could use the instrument for air quality monitoring. The ability to potentially deploy monitoring equipment on aerostats or UAV could provide means to improve air quality forecasts and to monitor for out of compliance emissions.

Management Team (cont.)

Principal Investigator:

- Darby Makel

Technology Areas

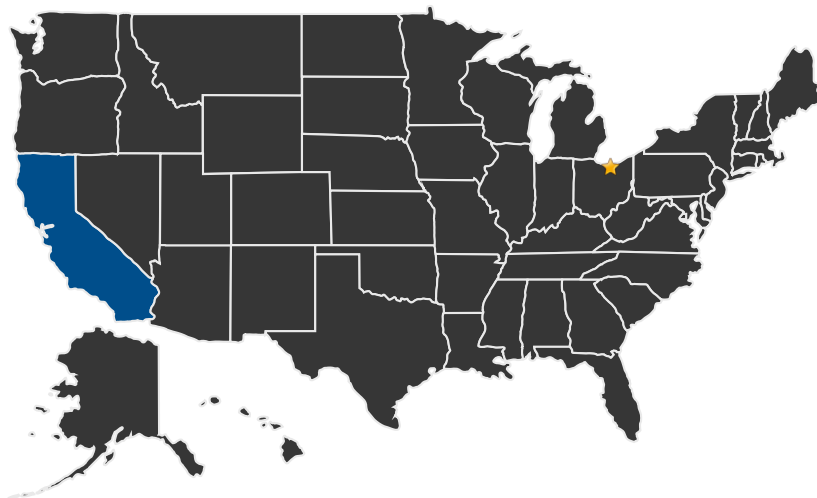
Secondary Technology Area:

Science Instruments, Observatories, and Sensor Systems (TA 8)

└ In-Situ Instruments and Sensors (TA 8.3)

└ In-Situ (other) (TA 8.3.3)

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ Lead Center:
Glenn Research Center

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Other Organizations Performing Work:

- Makel Engineering, Inc. (Chico, CA)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/18034>)

DETAILS FOR TECHNOLOGY 1

Technology Title

Chemical Microsensor Instrument for UAV Airborne Atmospheric Measurements